Project Week 05

Instructions:
Be verbose. Explain clearly your reasoning, methods, and results in your written work. Write clear code
that is well documented. With 99% certainty, you cannot write too many code comments.
Written answers are worth 8 points. Code is worth 2 points. 10 points total.

1. When finished, respond to the questions in Sakai as "done." We will record your grade there.
2. In your code repository, create a folder called "Week05."
3. In that folder, include
      a. a document (preferably a PDF) with your responses.
      b. All code
      c. A README file with instructions for us to run your code

Everything must be checked into your repository by **8am Saturday 10/26**. A pull will be done at that time.
Documents and code checked in after the instructors pull will not be graded.
Data for problems can be found in CSV files with this document in the class repository.

Problem 1:

In your main repository, create a Library for risk management. Create modules, classes, packages, etc as you see fit. Include all the functionality we have discussed so far in class. Make sure it includes:

1. Covariance estimation techniques.
2. Non-PSD fixes for correlation matrices
3. Simulation Methods
4. VaR calculation methods (all discussed)
5. ES calculation

Please check the repo https://github.com/dompazz/FinTech545_Fall2024/tree/main/ testfiles and make sure that all your functions can pass test files in the repo. Present your test cases pass results.

Problem 2:
Use the data in problem1.csv.
Calculate VaR and ES:
      a. Using a normal distribution with an exponentially weighted variance (lambda=0.97);
      b. Using a MLE fitted T distribution
      c. Using a Historic Simulation

Compare difference between VaR and ES under different probabilistic distributions. Explain the differences.

Problem 3:
Use your repository from #1.
Using Portfolio.csv and DailyPrices.csv. Calculate arithmetic returns. Assume the expected return on all stocks is 0. This file contains the stock holdings of 3 portfolios. You own each of these portfolios.

Fit Generalized T models to stocks in portfolios A and B, and fit a normal distributions to stocks in portfolio C. Calculate the VaR and ES of each portfolio as well as your total VaR and ES. You will need to use a copula. Compare the results from this to your VaR form Problem 3 from Week 4.